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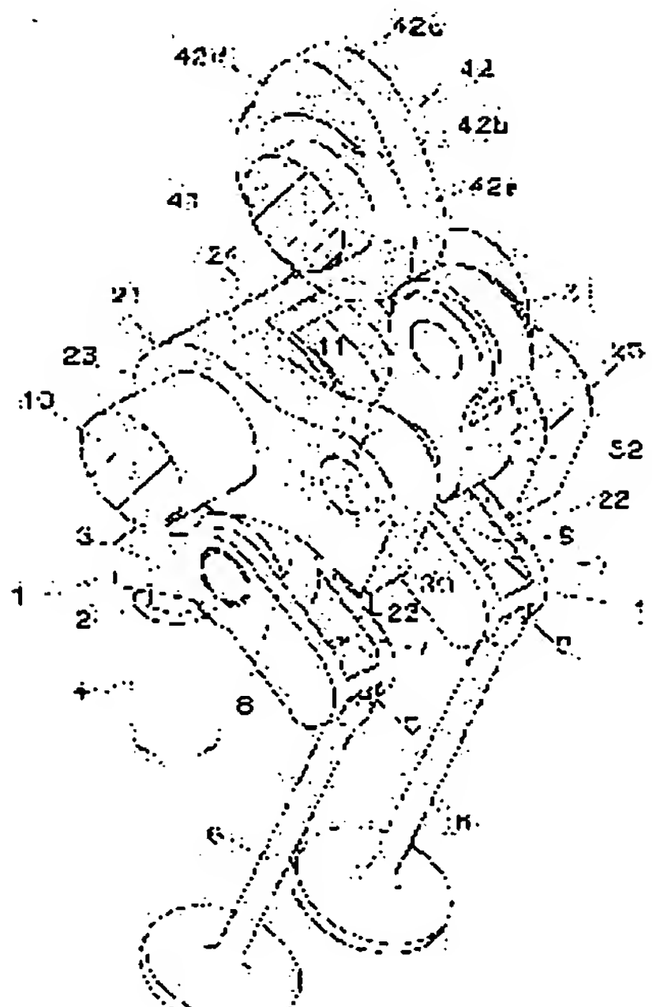
(54) VARIABLE VALVE SYSTEM

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce the number of shafts to simplify structure, and to make an engine head compact.
SOLUTION: The variable valve system comprises: a control cam 11 disposed to a control shaft 10 provided near a first roller 8 of a rocker arm 1; an interposing arm 21 disposed to be capable of swinging; a lever 32 disposed to the interposing arm 21 and having a second roller 30 and a third roller 31; a rotating cam 42 disposed to be rotatable and lifting valves 6, by pressing the third roller 31 in one direction of small angle rotation directions of the lever 32 to press the rocker arm 1 through the lever 32 and interposing arm 21 in this order; and a lift control apparatus changing a lift amount by the rotating cam 42 and the angle of action of the valves 6, by changing an orientation angle of the control cam 11.



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CLAIMS

[Claim(s)]
[Claim 1]
A control cam is formed in the control shaft prepared rotatable near the cam corresponding point of a rocker arm,
The surroundings of it are independently prepared for the inclusion arm equipped with the press side which presses said cam corresponding point rockable with rotation of said control cam focusing on said control shaft,
The lever which equipped said inclusion arm with the control cam slide contact section and the rotating cam slide contact section is prepared pivotable whenever [corniculus],
Said control cam contacts said control cam slide contact section so that the one direction of a hand of cut may be regulated whenever [corniculus / of said lever],
The rotating cam which said rocker arm is pressed [rotating cam] in the order through said lever and said inclusion arm, and carries out the lift of the bulb to it by pressing said rotating cam slide contact section to said one direction of a hand of cut whenever [corniculus / of said lever] is prepared pivotable,
By changing the orientation angle of said control cam continuously or gradually according to an internal combustion engine's operation situation in less than one revolution Rotate said lever whenever [corniculus] and the variation rate of said rotating cam slide contact section is made to carry out in the direction approaching said rotating cam. At the same time it moves the contact location of said rotating cam slide contact section and said rotating cam The adjustable valve gear which formed the lift control unit to which the amount of lifts and working angle of said bulb by said rotating cam are changed by changing and having the splash initiation angle of said inclusion arm, and changing the contact location of the press side of said inclusion arm to said cam corresponding point in the die-length direction of said inclusion arm.
[Claim 2]
The adjustable valve gear according to claim 1 supported to revolve by said inclusion arm pivotable whenever [corniculus] in the section the middle while said lever equipped the end section with said rotating cam slide contact section and equipped the other end with said control cam slide contact section.
[Claim 3]
The adjustable valve gear according to claim 1 with which it was supported to revolve by said inclusion arm pivotable whenever [corniculus] in the other end while said lever equipped the end section with said rotating cam slide contact section and said control cam slide contact section.
[Claim 4]
The adjustable valve gear according to claim 1 supported to revolve by said inclusion arm pivotable whenever [corniculus] in the other end while said lever equipped the end section with said rotating cam slide contact section and equipped the section with said control cam slide contact section the middle.
[Claim 5]
An adjustable valve gear given in any 1 term of claims 1-4 said whose cam corresponding points are the rollers fixed to revolve by said rocker arm pivotable.
[Claim 6]
An adjustable valve gear given in any 1 term of claims 1-5 either [at least / whose] said rotating cam slide contact section or the control cam slide contact section is the roller fixed to revolve by said inclusion arm pivotable.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the adjustable valve gear to which the amount of lifts and working angle of a bulb are changed continuously or gradually according to an internal combustion engine's operation situation.
[0002]
[Description of the Prior Art]
While rotating two cam shafts and making a rocker arm rock as a conventional adjustable valve gear, by changing the phase of two cam shafts relatively, the splash angle of a rocker arm is changed and there is a thing to which it was made to change continuously the amount of lifts or working angle of a bulb (for example, nonpatent literature 1 reference.).
Moreover, these people fix to revolve the first inclusion arm previously equipped with the press side which presses this cam corresponding point near the cam corresponding point of a rocker arm rockable. The second inclusion arm which equipped the first inclusion arm with the rotating cam slide contact section and the control cam slide contact section is fixed to revolve rockable. One cam shaft in which the rotating cam to which the lift of the bulb is carried out by pressing the rotating cam slide contact section from the one side of the splash direction of the second inclusion arm, and pressing a rocker arm through the second inclusion arm and the first inclusion arm in the order was formed is supported to revolve pivotable. One support shaft in which the control cam which presses the control cam slide contact section from the other side of the splash direction of the second inclusion arm was formed is supported to revolve pivotable. The splash initiation angle of the first inclusion arm is changed through changing the method of a splash of the second inclusion arm by changing the orientation angle of a control cam in less than one revolution. By having and changing the contact location of the press side of the first inclusion arm to a cam corresponding point in the die-length direction of the first inclusion arm The adjustable valve gear which formed the lift control unit to which the amount of lifts and working angle of a bulb by the rotating cam are changed was proposed (it sets at the time of an application for patent 2002-109042 and this application application, and is un-opening to the public).
[0003]
[Nonpatent literature 1]
Automotive engineering and "December, 1999 issue" incorporated company railroad Japan, Heisei 11, the 86 - 87th page
[0004]
[Problem(s) to be Solved by the Invention]
However, by the former type, although it was required to change the phase of two rotating cams and to make it rotate, there was a problem that actuation was difficult. Then, although actuation was made easy by reducing a rotating cam to one with the latter type, there was a problem that it became difficult for a total of three shafts of the arm shaft used as the splash shaft of a cam shaft, a support shaft, and the first inclusion arm to be needed, and to use an engine head as a compact.
[0005]
Then, it is to use an engine head as a compact while the object of this invention solves the above-mentioned technical problem, reduces a shaft and makes structure simple.
[0006]
[Means for Solving the Problem]
In order to attain the above-mentioned object, the adjustable valve gear of this invention A control cam is

formed in the control shaft prepared rotatable near the cam corresponding point of a rocker arm. The surroundings of it are prepared for the inclusion arm equipped with the press side which presses a cam corresponding point independently rockable [rotation of a control cam] focusing on a control shaft. The lever which equipped the inclusion arm with the control cam slide contact section and the rotating cam slide contact section is prepared pivotable whenever [corniculus]. By a control cam contacting the control cam slide contact section so that the one direction of a hand of cut may be regulated whenever [corniculus / of a lever], and pressing the rotating cam slide contact section to the one direction of a hand of cut whenever [corniculus / of a lever] By preparing the rotating cam which a rocker arm is pressed [rotating cam] in the order through a lever and an inclusion arm, and carries out the lift of the bulb to it pivotable, and changing the orientation angle of a control cam continuously or gradually according to an internal combustion engine's operation situation in less than one revolution Rotate a lever whenever [corniculus] and the variation rate of the rotating cam slide contact section is made to carry out in the direction approaching a rotating cam. By changing and having the splash initiation angle of an inclusion arm, and changing the contact location of the press side of the inclusion arm to a cam corresponding point in the die-length direction of an inclusion arm at the same time it moves the contact location of the rotating cam slide contact section and a rotating cam It is characterized by forming the lift control unit to which the amount of lifts and working angle of a bulb by the rotating cam are changed. In addition, a cam corresponding point is the semantics of the part which corresponds to a rotating cam through a lever and an inclusion arm, and is pressed.

[0007]

Although especially the configuration of a lever is not limited, it can illustrate the following mode.

(1) The mode supported to revolve by the inclusion arm pivotable whenever [corniculus] in the section the middle while equipping the end section with the rotating cam slide contact section and equipping the other end with the control cam slide contact section.

(2) The mode supported to revolve by the inclusion arm pivotable whenever [corniculus] in the other end while equipping the end section with the rotating cam slide contact section and the control cam slide contact section.

(3) The mode supported to revolve by the inclusion arm pivotable whenever [corniculus] in the other end while equipping the end section with the rotating cam slide contact section and equipping the section with the control cam slide contact section the middle.

[0008]

A roller also with the fixed pivotable hard chip is sufficient as a cam corresponding point. However, when a sliding friction and wear are taken into consideration, a cam corresponding point has the desirable roller fixed to revolve by the rocker arm pivotable.

[0009]

A roller also with the fixed pivotable hard chip is sufficient as the rotating cam slide contact section or the control cam slide contact section. However, when a sliding friction and wear are taken into consideration, the roller with which the rotating cam slide contact section or the control cam slide contact section was fixed to revolve pivotable [on the second inclusion arm] at least on the other hand (preferably both) is desirable.

[0010]

When both the rotating cam slide contact section and the control cam slide contact section are pivotable rollers, both rollers may be installed on the same axle, or may be formed on an parallel separate shaft. Moreover, one of one of the rollers is made into plane of symmetry, two rollers of another side are arranged, the force received from a rotating cam and a control cam can twist on a lever, and you may make it not produce stress.

[0011]

When either the rotating cam slide contact section or the control cam slide contact section is a pivotable roller, as another side, the roller cantilevered suspension section formed in the lever, the fork piece of the couple formed in the lever which supports a roller from both sides, etc. can be illustrated. Moreover, the roller envelopment section which wraps in a part of side peripheral surface [at least] of a roller is constructed so that a revolution of a roller may not be barred between fork pieces, and it is good also considering this roller envelopment section as the other side of the rotating cam slide contact section and the control cam slide contact section.

[0012]

Although you may rotate whenever [splash or corniculus] in another field, as for a rocker arm, an inclusion arm, and a lever, it is desirable to rotate whenever [splash or corniculus] on space efficiency and in the

same side.
[0013]
Here, which the following type is sufficient as a rocker arm.
(a) The type which has the center-of-oscillation section in the end section of a rocker arm, has a cam corresponding point in a center section, and has the bulb press section in an other end edge. (The so-called swing arm)
(b) The type which has the center-of-oscillation section in the center section of the rocker arm, has a cam corresponding point in the end section, and has the bulb press section in an other end edge.
[0014]
The two following modes can be illustrated as the center-of-oscillation section.
(i) The center-of-oscillation section is a mode which is the concave spherical-surface section supported by the pivot.
(ii) The center-of-oscillation section is a mode which is the axial hole section with which the seesaw arm was supported to revolve rotatable.
[0015]
In the mode of the above (i), it is desirable that a tappet-clearance adjustment device is prepared in the center-of-oscillation section. For example, the tappet-clearance adjustment device thrust into the female screw which formed the male screw formed in the pivot in pivot supporting material possible [the amount accommodation of screwing], the thing which prepares the pivot possible [sliding] to pivot supporting material, and was made to carry out regulating automatically of the tappet clearance with oil pressure can be illustrated.
[0016]
It is desirable to establish an energization means to energize an inclusion arm and a lever so that the rotating cam slide contact section and the control cam slide contact section may always **** for a rotating cam and a control cam, respectively. Especially as an energization means, although not limited, the spring member which energizes a lever so that the rotating cam slide contact section of a lever and the control cam slide contact section may not estrange from a rotating cam and a control cam by energizing an inclusion arm along the splash direction is desirable.
What prepared the spring member its specifically pushed and drawn in between the projections and the cylinder heads which were prepared apart from the arm section of an inclusion arm or the arm section can be illustrated.
[0017]
Especially as a lift control unit, although not limited, the thing equipped with a helical spline device, the actuator using oil pressure, and control units, such as a microcomputer, can be illustrated.
[0018]
In addition, although the adjustable valve gear of this invention is also applicable to either an intake valve or an exhaust air bulb, applying to both is desirable.
[0019]
[Embodiment of the Invention]
Hereafter, the example of the first operation gestalt of the adjustable valve gear which carried out this invention is explained with reference to drawing 1 - drawing 5 . Two swing-arm type rocker arms 1 are used for this adjustable valve gear, and the end section of each rocker arm 1 is the center-of-oscillation section in which the pivot 3 comes to support the concave spherical-surface section 2 formed in the said division. Each pivot 3 builds in the tappet-clearance adjustment device with a screw. The bulb press section 5 is cut in the other end lower part of each rocker arm 1, and the bulb press section 5 presses the end face section of a bulb 6 in it.
[0020]
On the roller arrangement hole 7 formed in the center section of each rocker arm 1, the first roller 8 as a cam corresponding point is arranged so that it may project a little from the top face of a rocker arm 1, and this first roller 8 is fixed to revolve pivotable around the shaft which intersects perpendicularly with an arm side attachment wall.
[0021]
The male screw formed in the axial lower part of the pivot 3 is thrust into the female screw formed in the pivot supporting material 4 possible [the amount accommodation of screwing], and the tappet-clearance adjustment device is constituted. In addition, a tappet-clearance adjustment device may be changed into that to which the pivot 3 is made the configuration which can slide to the pivot supporting material 4, and

regulating automatically of the tappet clearance is carried out with oil pressure.
[0022]
While the control shaft 10 is formed rotatable near the upper part of the first roller 8, the control cam 11 is formed in this control shaft 10. the nose which the control cam 11 is smoothly connected from base circle 11a which is the peripheral face of the control shaft 10, and base circle 11a, and the amount of projection increases gradually -- it has gradual increase section 11b.
[0023]
Moreover, the surroundings of it are independently prepared in the inclusion arm 21 equipped with the press side 22 which presses the first roller 8 rockable with rotation of the control cam 11 focusing on the control shaft 10. That is, the arm section 25 of the couple to which the body 23 of the end face is extrapolated by the control shaft 10, and the inclusion arm 21 extends in abbreviation parallel toward the bulb press section side of a rocker arm 1 in the direction both ends of an axis of the inclusion arm 21 from a body 23 is formed. The underside of each arm section 25 is the press side 22 for pressing the first roller 8 located in directly under.
[0024]
Each press side 22 is formed in the concave bend side of larger radius of curvature than the radius of the first roller 8, and even if the contact location of the press side 22 over the first roller 8 changes in the die-length direction of the inclusion arm 21 so that it may mention later, the press side 22 presses the first roller 8 in the direction of an abbreviation perpendicular.
[0025]
Moreover, it was formed, and the control cam 11 is missed, lets an aperture 24 pass so that it may be open for free passage from the inside of a body 23 to an outside in the abbreviation center section of this body 23, and it is made to project by the outside of a body 23.
[0026]
It misses, and to the hoop direction of a body 23, the aperture 24 is equipped with the die length for 11 round for abbreviation 12 minutes of a body 23, and the control cam 11 can rock it now in the predetermined include-angle range relatively to the inclusion arm 21.
[0027]
Between the arm sections 25 of a couple, the lever 32 equipped with the second roller 30 as the control cam slide contact section and the third roller 31 as the rotating cam slide contact section is formed pivotable whenever [corniculus]. While a lever 32 equips the upper bed section with the third roller 31 and equipping the soffit section with the second roller 30, in the center section, it is supported to revolve by the arm section 25 pivotable whenever [corniculus], and the control cam 11 is in contact with the second roller 30 so that the one direction (the direction of a RRC in drawing 2) of a hand of cut may be regulated whenever [corniculus / of a lever 32].
[0028]
The third roller 31 is arranged on fork 32a formed in the upper bed section of a lever 32, and the third roller 31 is fixed to revolve pivotable around the shaft which intersects perpendicularly with the side attachment wall of fork 32a. Moreover, the second roller 30 is arranged on fork 32b formed in the soffit section of a lever 32, and the second roller 30 is fixed to revolve pivotable around the shaft which intersects perpendicularly with the side attachment wall of fork 32b. Moreover, the second roller 30 is formed in the control cam 11 and abbreviation same width of face.
[0029]
Moreover, the energization means (graphic display abbreviation) is connected to the inclusion arm 21, it is always energized in the direction which keeps away the arm section 25 from the first roller 8, and the third roller 31 and the second roller 30 always **** for the rotating cam 42 and the control cam 11 which are mentioned later, respectively.
[0030]
Moreover, the rotating cam 42 which a rocker arm 1 is pressed [rotating cam] in the order through a lever 32 and the inclusion arm 21, and carries out the lift of the bulb 6 to it by pressing the third roller 31 whenever [corniculus / of a lever 32] to the one direction (the direction of a RRC in drawing 2) of a hand of cut is formed in the upper part by the side of the center-of-oscillation section as used in the field of the rocker arm 1 of a lever 32 pivotable.
[0031]
the nose to which base circle 42a and the amount of projection increase a rotating cam 42 gradually -- gradual increase section 42b and the nose used as the amount of the maximum projection -- 42c and the nose which the amount of projection dwindles -- it consists of 42d of the gradual decrease sections, and is formed

in the cam shaft 41 supported pivotable. Moreover, the rotating cam 42 is formed in the third roller 31 and abbreviation same width of face.

[0032]

Gradual [continuously / orientation angle / of the control cam 11 / according to an internal combustion engine's operation situation / in less than one revolution] (three or more steps preferably) at the control shaft 10 Rotate a lever 32 whenever [corniculus] and the variation rate of the third roller 31 is made to carry out in the direction approaching a rotating cam 42 by changing into four or more steps of multistage stories still more preferably. It is the splash initiation angle (it is the include angle of the inclusion arm 21 when base circle 42a of a rotating cam 42 is in contact with the third roller 31) of the inclusion arm 21 at the same time it moves the contact location of the third roller 31 and a rotating cam 42. It changes. the contact location of the control cam 11 and the second roller 30 -- changing -- The lift control unit (graphic display abbreviation) to which the amount of lifts and working angle of a bulb 6 by the rotating cam 42 are changed is connected by having and changing the contact location of the press side 22 of the inclusion arm 21 to the first roller 8 in the die-length direction of the inclusion arm 21.

[0033]

While the piston which prepared for example, the helical spline is accompanied by the revolution of a predetermined angle with oil pressure, it moves to shaft orientations, and this revolution has the structure of changing the orientation angle of the control cam 11 in less than one revolution by rotating a control shaft, and a lift control unit is controlled by control units, such as a microcomputer, based on the detection value from an internal combustion engine's revolution sensor, an accelerator opening sensor, etc.

[0034]

By the above-mentioned configuration, the control cam 11 in the condition of having regulated that a lever 32 rotates whenever [corniculus] in the direction of a RRC in contact with the second roller 30 A rotating cam 42 presses the third roller 31 to a slanting lower part in a lower part while going to a bulb press section side from the center-of-oscillation section side as used in the field of a rocker arm 1 -- to the sense which rotates a lever 32 in the direction of a RRC whenever [corniculus]. When a rocker arm 1 is pressed by the order through a lever 32 and the inclusion arm 21, the lift of the bulb 6 is carried out. At this time, the lever 32 which had the third roller 31 pressed by the rotating cam 42 is displaced below, moving the contact location of the second roller 30 and the control cam 11 to a side with the large amount of projection, and rocks the inclusion arm 21 pressed below through this lever 32 in the predetermined include-angle range.

[0035]

moreover -- setting to base circle 11a the location which changes the orientation angle of the control cam 11 and contacts the second roller 30 at this time **** -- a nose -- by making it every place of gradual increase section 11b , a lever 32 will rotate whenever [corniculus] , a position will change , a variation rate will be carry out in the direction in which the third roller 31 approaches a rotating cam 42 , and the splash initiation angle of the inclusion arm 21 will also change . Then, the contact location of the press side 22 of the inclusion arm 21 to the first roller 8 changes in the die-length direction of the inclusion arm 21, and when the splash initiation angle of the inclusion arm 21 is high, the contact location of the press side 22 serves as 25 arm sections one end, and when the splash initiation angle of the inclusion arm 21 is low, specifically, the contact location of the press side 22 becomes an arm section 25 head side.

[0036]

The adjustable valve gear constituted as mentioned above acts as follows.

First, drawing 2 (a) -> (b) shows the operation by whenever [orientation angle / of the control cam 11 under the operation situation which needs the amount of the maximum lifts, and the maximum working angle], and it.

the time of the contact location to the third roller 31 of a rotating cam 42 being a location of base circle 42a under the operation situation which needs the amount of the maximum lifts, and the maximum working angle, as shown in drawing 2 (a) -- the control cam 11 -- a nose -- orientation control is carried out so that near the medium lobe of gradual increase section 11b may contact the second roller 30. Since the contact location of the control cam 11 where the second roller 30 has contacted has the big amount of projection compared with base circle 11a at this time, a lever 32 is rotated whenever [corniculus] in the direction of a RLC to the inclusion arm 21. Then, in order to carry out a variation rate in the direction in which the third roller 31 approaches a rotating cam 42 with a revolution whenever [corniculus / of a lever 32], the third roller 31 which is in contact with base circle 42a of a rotating cam 42 carries out the variation rate of the lever 32 to a lower part while it is a little hidden in the rotating cam 42 bottom along with base circle 42a. It follows on the variation rate of this lever 32, and the inclusion arm 21 serves as a splash initiation angle of

the inclusion arm 21 under an operation situation with an inclination and its location a little required for the amount of the maximum lifts, and the maximum working angle to a lower part. Even if the splash initiation angle of the inclusion arm 21 at this time is called place to which it inclined a little below, since it is still high, the contact location of the press side 22 of the inclusion arm 21 to the first roller 8 is 25 arm sections one end (in detail body 23), and the lift of a bulb 6 is not generated yet.
[0037]
next, the contact location to the between 31 from drawing 2 (a) to drawing 2 (b), i.e., the third roller of a rotating cam 42, -- the nose from base circle 42a, when displacing to gradual increase section 42b The inclusion arm 21 which supported the lever 32 to revolve while the third roller 31 received press in lower right direction by the rotating cam 42 and the lever 32 displaced below resists energization by the energization means, and increases an inclination caudad. Since the contact location to the control cam 11 of the second roller 30 moves to a side with the larger amount of projection than that of the lower part of the control cam 11 at this time, a lever 32 begins a revolution whenever [corniculus] in the direction of a RLC relatively to the inclusion arm 21. However, whenever [corniculus / of the direction of a RLC over the inclusion arm 21 of a lever 32], since it is larger than a rotation, if the direction of the amount of splashes of the direction of a RRC of the inclusion arm 21 looks at a lever 32 on the whole, it will incline in the direction of a RRC. While two press sides 22 of the inclusion arm 21 carry out the variation rate of the contact location to the first two roller 8 to the press side 22 side from a body 23, it is begun below to press the first two roller 8 at this time. Two rocker arms 1 start a splash below focusing on each pivot 3 corresponding to the first two roller 8 beginning to be pressed, respectively, the bulb press section 5 presses two bulbs 6 caudad, and the lift of each bulb 6 begins to be carried out.
[0038]
next, it is shown in drawing 2 (b) -- as -- the nose of a rotating cam 42 -- pass gradual increase section 42b -- a nose -- a contact location [as opposed to / when 42c ****s on the third roller 31 / the control cam 11 of the second roller 30 in a lever 32] -- a nose -- making it move near the maximum lobe of gradual increase section 11b, and being greatly inclined in the direction of a RRC, while displacing caudad In connection with the variation rate of this lever 32, the inclusion arm 21 resists energization by the energization means, is rocked to max below, and serves as a splash termination angle of the inclusion arm 21 under an operation situation with that location required for the amount of the maximum lifts, and the maximum working angle. Then, since the contact location of the press side 22 of the inclusion arm 21 to the first roller 8 changes to an arm section 25 head side and the inclusion arm 21 makes max rock a rocker arm 1 below, the amount L of lifts of a bulb 6 occurs and increases, and reaches Maximum Lmax, and a working angle also serves as max.

In addition, even if said contact location changes as aforementioned, since the press side 22 formed in the concave bend side presses the first roller 8 in the direction of an abbreviation perpendicular, the stress component of the die-length direction hardly arises on the inclusion arm 21, and a burden is not placed on between a body 23 and the control shaft 10 by it.
[0039]
Next, drawing 3 (a) -> (b) shows the operation by whenever [orientation angle / of the control cam 11 under the operation situation which needs the amount of minute lifts, and a minute working angle], and it.
the time of the contact location to the third roller 31 of a rotating cam 42 being a location of base circle 42a under the operation situation which needs the amount of minute lifts, and a minute working angle, as shown in drawing 3 (a) -- the control cam 11 -- a nose -- orientation control is carried out so that near the small lobe of gradual increase section 11b may contact the second roller 30. Since the amount of projection becomes small from the time of the contact location of the control cam 11 where the second roller 30 has contacted being drawing 2 (a) at this time, a lever 32 is rotated whenever [corniculus] in the direction of a RRC rather than the time of drawing 2 (a) to the inclusion arm 21. Then, in order to carry out a variation rate in the direction in which the third roller 31 keeps away from a rotating cam 42 with a revolution whenever [corniculus / of a lever 32], the third roller 31 which is in contact with base circle 42a of a rotating cam 42 carries out the variation rate of the lever 32 upwards while carrying out the variation rate of the contact location with a rotating cam 42 to upper right direction rather than the time of drawing 2 (a) along with base circle 42a. In connection with the variation rate of this lever 32, an inclination and its location serve as a splash initiation angle of the inclusion arm 21 under the operation situation which needs the amount of minute lifts, and a minute working angle from the time of the inclusion arm 32 being drawing 2 (a) to mist or the upper part. Even if the splash initiation angle of the inclusion arm 21 at this time is called place to which it inclined a little below, since it is still high, the contact location of the press side 22 of the inclusion

arm 21 to the first roller 8 is the end face side (in detail body 23) of the arm section 25, and the lift of a bulb 6 is not generated yet.
[0040]
next, the contact location to the between 31 from drawing 3 (a) to drawing 3 (b), i.e., the third roller of a rotating cam 42, -- the nose from base circle 42a, when displacing to gradual increase section 42b The inclusion arm 21 which supported the lever 32 to revolve while the third roller 31 received press in lower right direction by the rotating cam 42 and the lever 32 displaced below resists energization by the energization means, and increases an inclination caudad. Since the contact location to the control cam 11 of the second roller 30 moves to a side with the larger amount of projection than that of the lower part of the control cam 11 rather than the time of drawing 3 (a) at this time, a lever 32 begins a revolution whenever [corniculus] in the direction of a RLC to the inclusion arm 21. However, whenever [corniculus / of the direction of a RLC over the inclusion arm 21 of a lever 32], since it is larger than a rotation, if the direction of the amount of splashes of the direction of a RRC of the inclusion arm 21 looks at a lever 32 on the whole, it will incline in the direction of a RRC. While two press sides 22 of the inclusion arm 21 carry out the variation rate of the contact location to the first two roller 8 to the press side 22 side from a body 23, it is begun below to press the first two roller 8 at this time. Two rocker arms 1 start a splash below focusing on each pivot 3 corresponding to the first two roller 8 beginning to be pressed, respectively, the bulb press section 5 presses two bulbs 6 caudad, and the lift of each bulb 6 begins to be carried out.
[0041]
next, it is shown in drawing 3 (b) -- as -- the nose of a rotating cam 42 -- pass gradual increase section 42b -- a nose, when 42c ****s on the third roller 31 a contact location [as opposed to the control cam 11 of the second roller 30 in a lever 32] -- the time of drawing 3 (a) -- the nose of mist or the bottom -- make it move near the inside lobe of gradual increase section 11b, and lever 32 the very thing will be greatly inclined in the direction of a RRC while displacing it caudad In connection with the variation rate of this lever 32, the inclusion arm 21 resists energization by the energization means, is rocked caudad, and serves as a splash termination angle of the inclusion arm 21 under an operation situation with that location required for the amount of minute lifts, and a minute working angle. However, since the contact location of the press side 22 of the inclusion arm 21 to the first roller 8 stops at the end face section of the press side 22, the inclusion arm 21 makes a rocker arm 1 rock slightly below, and the amount L of lifts of a bulb 6 becomes minute. Moreover, it is the place to which it inclined more nearly up than the time of the splash initiation angle of the inclusion arm 21 being drawing 2 (a), and since it is restricted near a splash termination angle that the lift of the bulb 6 is carried out, it becomes minute [a working angle] (refer to drawing 5).
[0042]
In addition, under the operation situation which needs in-between amount of lifts and working angle of drawing 2 and drawing 3 , as whenever [orientation angle / of the in-between control cam 11 of drawing 2 and drawing 3] is shown in drawing 5 by making continuously or gradually with a lift control unit, in-between amount of lifts and working angle are obtained continuously or gradually.
[0043]
Next, drawing 4 (a) -> (b) shows the operation by whenever [orientation angle / of the control cam 11 under the operation situation which needs a lift pause], and it.
As shown in drawing 4 (a), when the contact location to the third roller 31 of a rotating cam 42 is a location of base circle 42a under the operation situation which needs a lift pause, orientation control of the control cam 11 is carried out so that base circle 11a (it can be said also as the peripheral face of the control shaft 10) may contact the second roller 30. Since the amount of projection becomes small from the time of the contact location of the control cam 11 where the second roller 30 has contacted being drawing 3 (a) at this time, a lever 32 is rotated whenever [corniculus] in the direction of a RRC rather than the time of drawing 3 (a) to the inclusion arm 21. Then, in order to carry out a variation rate in the direction in which the third roller 31 keeps away from a rotating cam 42 further with a revolution whenever [corniculus / of a lever 32], the third roller 31 which is in contact with base circle 42a of a rotating cam 42 carries out the variation rate of the lever 32 upwards while carrying out the variation rate of the contact location with a rotating cam 42 to upper right direction rather than the time of drawing 3 (a) along with base circle 42a. In connection with the variation rate of this lever 32, it inclines upwards further, the arm section 25 serves as an abbreviation horizontal from the time of the inclusion arm 32 being drawing 3 (a), and that location serves as a splash initiation angle of the inclusion arm 21 under the operation situation which needs a lift pause. Since the splash initiation angle of the inclusion arm 21 at this time is high, the contact location of the press side 22 of the inclusion arm 21 to the first roller 8 is the end face side (in detail body 23) of the arm section 25, and the

lift of a bulb 6 is not generated.
[0044]
next, the contact location to the between 31 from drawing 4 (a) to drawing 4 (b), i.e., the third roller of a rotating cam 42, -- the nose from base circle 42a, when displacing to gradual increase section 42b The inclusion arm 21 which had the lever 32 supported to revolve while the third roller 31 received press in lower right direction by the rotating cam 42 and the lever 32 displaced below resists energization by the energization means, and increases an inclination caudad. At this time, since the contact location to the control cam 11 of the second roller 30 does not change from base circle 11a, a lever 32 suspends a revolution whenever [over the inclusion arm 21 / corniculus], and inclines in one with the inclusion arm 21. Although two press sides 22 of the inclusion arm 21 carry out the variation rate of the contact location to the first two roller 8 toward the press side 22 side from a body 23 at this time, since a contact location stops in a body 23, the first two roller 8 is not pressed and each bulb 6 does not start a lift.
[0045]
next, it is shown in drawing 4 (b) -- as -- the nose of a rotating cam 42 -- pass gradual increase section 42b -- a nose, when 42c ****s on the third roller 31 A lever 32 will be most greatly inclined in the direction of a RRC while lever 32 the very thing displaces caudad the contact location to the control cam 11 of the second roller 30 slightly by making it move to base circle 11a of mist or the bottom from the time of drawing 4 (a). In connection with the variation rate of this lever 32, the inclusion arm 21 resists energization by the energization means, is rocked caudad, and serves as a splash termination angle of the inclusion arm 21 under an operation situation with that location required for a lift pause. However, since the contact location of the press side 22 of the inclusion arm 21 to the first roller 8 stops in a body 23, the inclusion arm 21 will not make a rocker arm 1 rock, but a bulb 6 will be in lift hibernation.
[0046]
Since the control shaft 10 in which the control cam 11 was formed serves as the shaft which supports the inclusion arm 21 rockable according to the above adjustable valve gears, while being able to reduce the shaft which three needed for the engine head conventionally to two of the control shaft 10 and a cam shaft 41 and making an adjustable valve gear simple, an engine head can be used as a compact and an engine can be miniaturized.
[0047]
Next, only a part which is different from the first operation gestalt with reference to drawing 6 - drawing 7 about the second operation gestalt of the adjustable valve gear which carried out this invention is explained. The adjustable valve gear of this operation gestalt is different from the first operation gestalt only in the configuration of the control cam slide contact section of a lever, the press direction of the lever by the rotating cam, a rotating cam, the number of the third rollers, and the configuration of an inclusion arm.
[0048]
That is, the adjustable valve gear of this operation gestalt is supported to revolve by the inclusion arm 21 pivotable whenever [corniculus] in the soffit section while a lever 35 equips the upper bed section with the third roller 31 as the rotating cam slide contact section, and the second roller 30 as the control cam slide contact section.
[0049]
While fork 36 is formed in the upper bed section of a lever 35 and the second roller 30 is arranged on the paries medialis orbitae of fork 36, the second roller 30 is fixed to revolve pivotable by it around the shaft which intersects perpendicularly with the paries medialis orbitae of fork 36. Moreover, while the second roller 30 and the third two roller 31 of an abbreviation same outer diameter are arranged on both the outsides of fork 36 on the second roller 30 and the same axle on both sides of fork 36 and the second roller 30, each third roller 31 is fixed to revolve pivotable around the shaft which intersects perpendicularly with the paries lateralis orbitae of fork 36. Moreover, the second roller 30 and the third roller 31 are pivotable mutual independently. In addition, it may be formed in a different outer diameter in the second roller 30 and the third roller 31. Moreover, the third two roller 31 may be reduced to one.
[0050]
Moreover, the rotating cam 42 is increased by two in connection with the third roller 31 having increased in number to two. Two rotating cams 42 set predetermined spacing, and are formed in the cam shaft 41 so that it may **** on the third two roller 31 exactly, respectively.
[0051]
Moreover, a lever 35 is allotted between the lever supporters 37 of the couple formed so that it might extend from a body 23 to a slanting lower part independently [the arm section 25], and this lever 35 is fixed to

revolve rockable around the shaft which intersects perpendicularly with the paries medialis orbitae of the lever supporter 37. In addition, the lever 35 may be fixed to revolve by the arm section 25 rockable like the first operation gestalt.
[0052]
Moreover, although the rotating cam 42 was formed in the center-of-oscillation section side as used in the field of the rocker arm 1 of a lever 32 with the first operation gestalt, the rotating cam 42 is formed in the bulb press section side as used in the field of the rocker arm 1 of a lever 35 with this operation gestalt. Therefore, a rotating cam 42 presses a lever 35 below, pressing the third roller 31 toward a center-of-oscillation section side from the bulb press section side as used in the field of a rocker arm 1.
[0053]
The adjustable valve gear of this operation gestalt is the same as that of the first operation gestalt fundamentally, although the configuration of a lever 35, the press direction of the lever 35 by the rotating cam 42, a rotating cam, and the number of the third rollers differ from the configuration of the inclusion arm 21. And according to this operation gestalt, while the same effectiveness as the first operation gestalt is acquired, by having used the lever 35 shorter than a lever 32, the location of a rotating cam 42 can be brought close to a bulb 6, the dimension of an adjustable valve gear is contracted to the die-length direction of a bulb 6, and it can be made a compact. An engine head can be miniaturized by this and an engine miniaturization can be attained.
[0054]
Next, only a part which is different from the second operation gestalt with reference to drawing 8 - drawing 9 about the third operation gestalt of the adjustable valve gear which carried out this invention is explained. The adjustable valve gear of this operation gestalt is different from the second operation gestalt only in the configuration of a lever.
[0055]
That is, the adjustable valve gear of this operation gestalt is supported to revolve by the inclusion arm 21 pivotable whenever [corniculus] in the soffit section of a lever 39 while a lever 39 equips the upper bed section with the third one roller 31 as the rotating cam slide contact section and equips the abbreviation center section of the lever 39 with the second roller 30 as the control cam slide contact section.
[0056]
A lever 39 is changed into the thing of die length the abbreviation [twice] of the lever 35 of the second operation gestalt, and both the third roller 31 and the rotating cam 42 are reduced by one. Moreover, the second roller 30 is arranged so that it may project a little from the side face of a lever 39 in the roller arrangement hole 40 cut in the abbreviation center section of the lever 39, and it is fixed to revolve pivotable around the shaft which intersects perpendicularly with the paries medialis orbitae of the roller arrangement hole 40.
[0057]
Therefore, the adjustable valve gear of this operation gestalt is the same as that of the first operation gestalt and the second operation gestalt fundamentally, although a lever 39 becomes long rather than the lever 35 of the second operation gestalt. And since the lever 39 is longer than the lever 35 of the second operation gestalt, although a miniaturization of the engine like the second operation gestalt cannot be desired, since it is not necessary to form a rotating cam 42 and every third two roller 31 according to this operation gestalt, components mark can be reduced and structure of an adjustable valve gear can be made simple.
[0058]
In addition, this invention is not limited to the configuration of said operation gestalt, and can also be changed and materialized in the range which does not deviate from the meaning of invention as follows.
(1) Change the method of the configuration of a lift control unit, or control suitably.
(2) Consider as the rocker arm which has the center-of-oscillation section in a center section.
(3) Form the second roller 30 and every two control cams 11 in the second operation gestalt instead of forming the third roller 31 and every two rotating cams 42.
(4) Change the configuration of an energization means suitably.
[0059]
[Effect of the Invention]
Since it is constituted as above-mentioned, the adjustable valve gear of this invention can use an engine head as a compact while it reduces a shaft and makes structure simple.
[Brief Description of the Drawings]
[Drawing 1] It is the perspective view showing the adjustable valve gear concerning the first operation

gestalt of this invention.
[Drawing 2] It is the sectional view showing an operation of this device when the amount of the maximum lifts and working angle of drawing 1 are required.
[Drawing 3] It is the sectional view showing an operation of this device when the amount of minute lifts and working angle of drawing 1 are required.
[Drawing 4] It is the sectional view showing an operation of this device when the lift pause of drawing 1 is required.
[Drawing 5] It is the graph which shows the amount of lifts and working angle of a bulb which are obtained by the adjustable valve gear concerning this operation gestalt.
[Drawing 6] It is the perspective view showing the adjustable valve gear concerning the second operation gestalt of this invention.
[Drawing 7] It is the sectional view showing this adjustable valve gear.
[Drawing 8] It is the perspective view showing the adjustable valve gear concerning the third operation gestalt of this invention.
[Drawing 9] It is the sectional view showing this adjustable valve gear.
[Description of Notations]
1 Rocker Arm
6 Bulb
8 First Roller as a Cam Corresponding Point
10 Control Shaft
11 Control Cam
21 Inclusion Arm
22 Press Side
42 Rotating Cam
30 Second Roller as the Control Cam Slide Contact Section
31 Third Roller as the Rotating Cam Slide Contact Section
32 Lever
42 Rotating Cam
41 Cam Shaft

[Translation done.]

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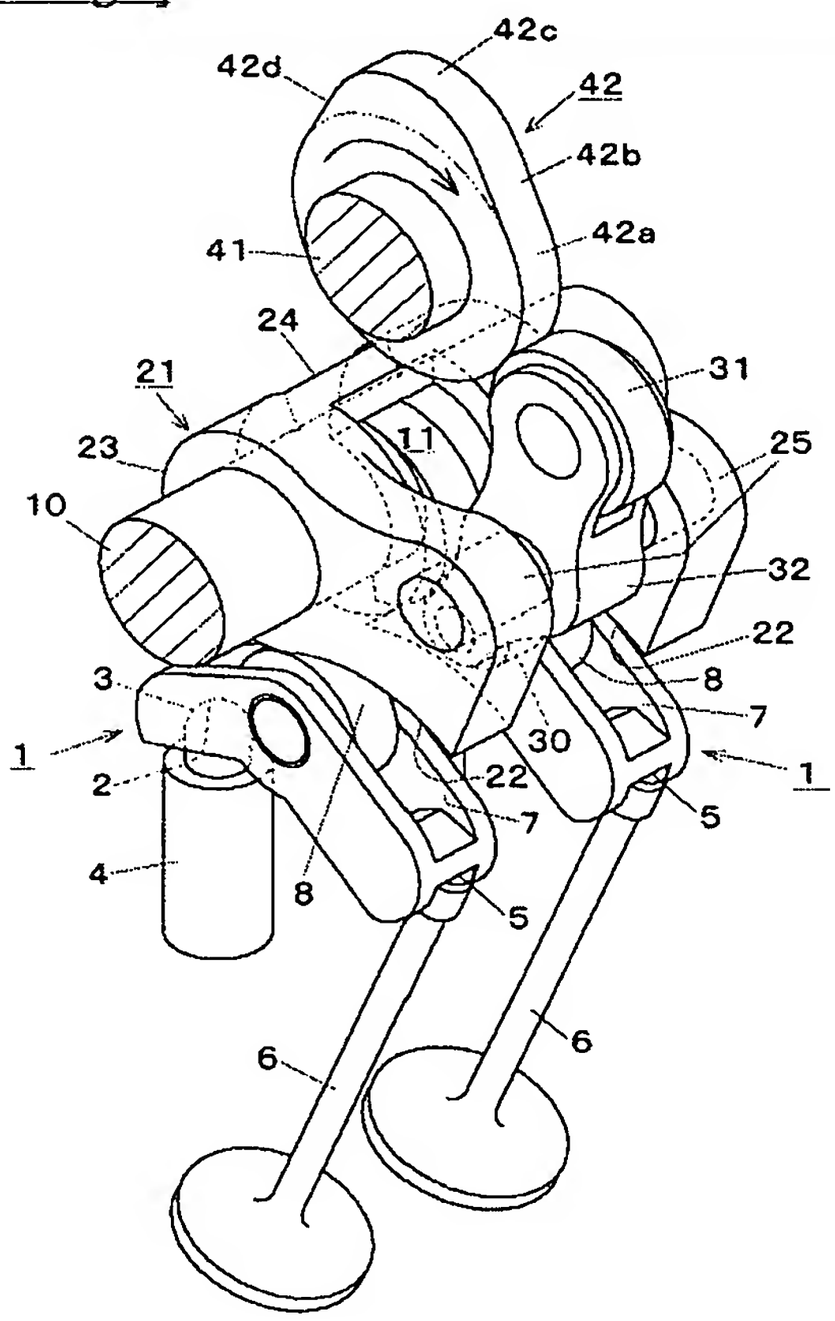
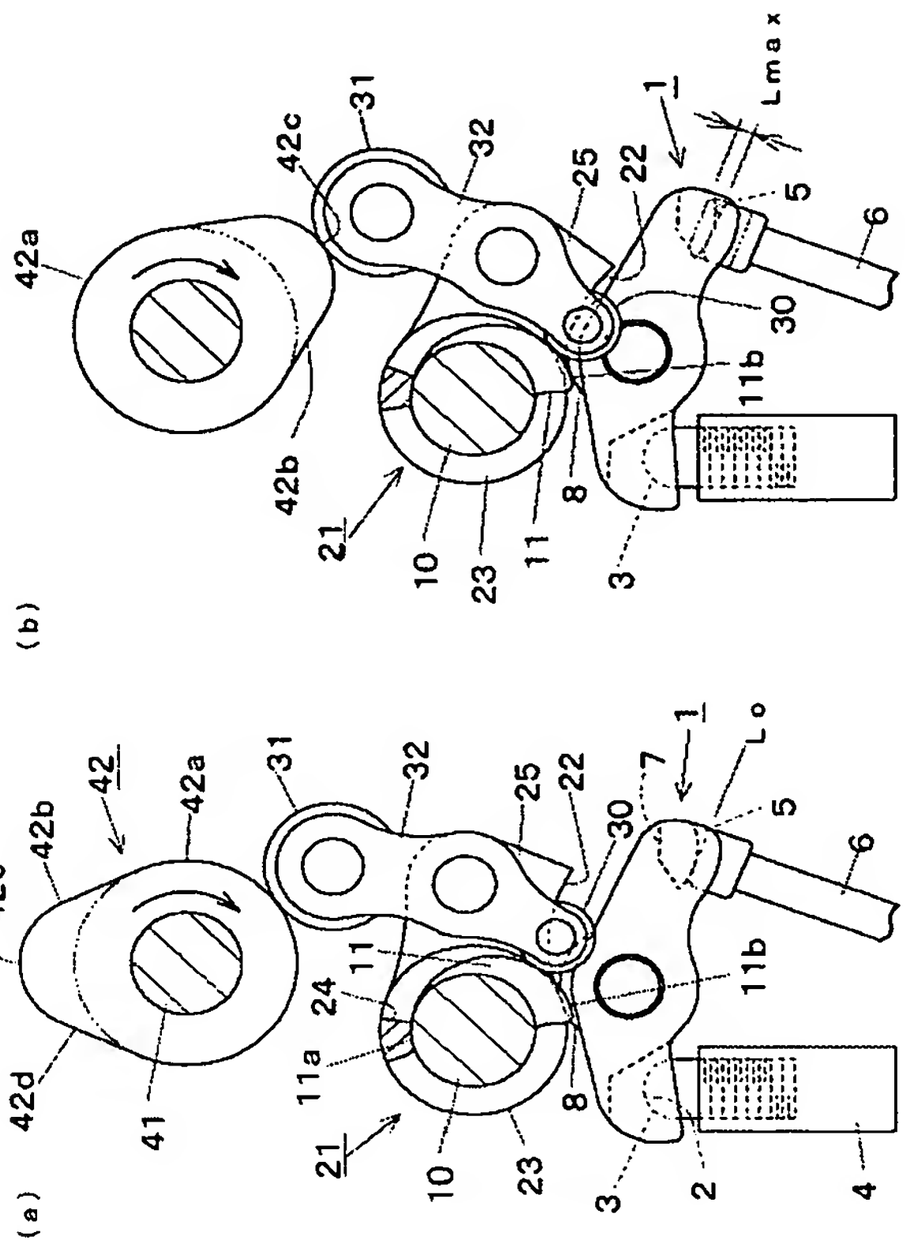
DRAWINGS

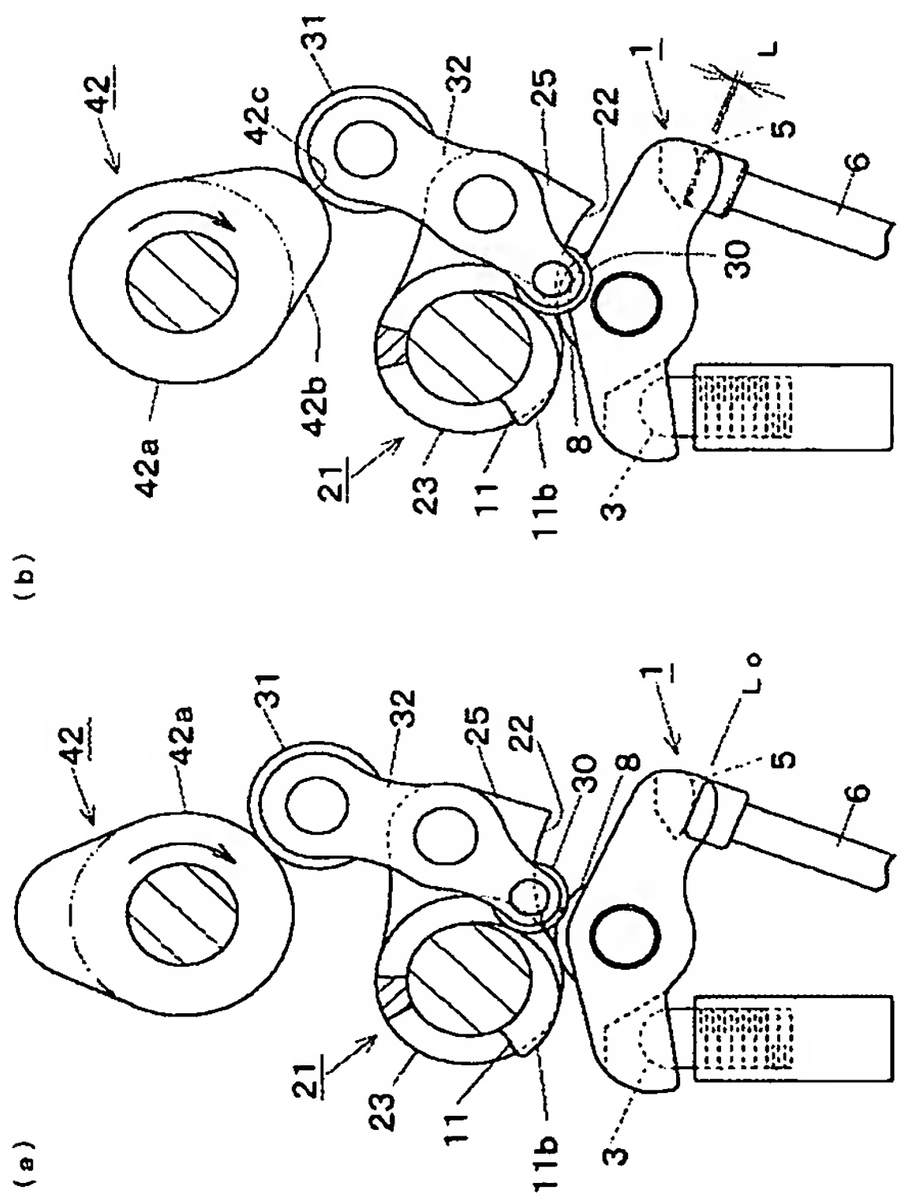
[Drawing 1]



[Drawing 2]


(b)
42a
42c
31
32
25
22
1
Lmax
5
6
30
11b
42b
21
10
23
11
8
3
(a)
42
42b
42a
42c
42d
41
31
32
25
22
30
7
L
5
6
11
24
11a
11b
8
21
10
23
3
2
4

[Drawing 3]


(b)
42
42c
31
32
25
22
1
L
5
6
30
42a
42b
21
23
11
11b
8
3
(a)
42
42a
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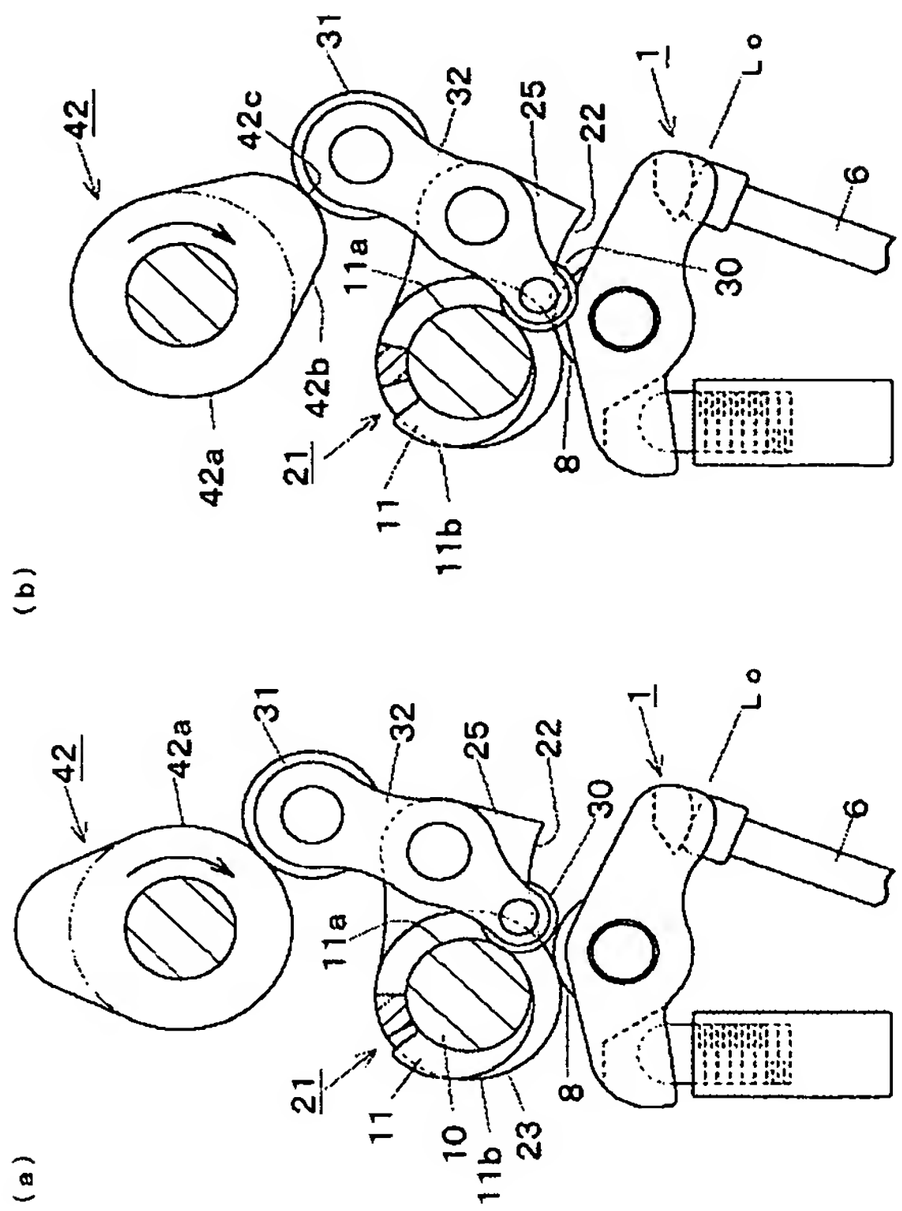
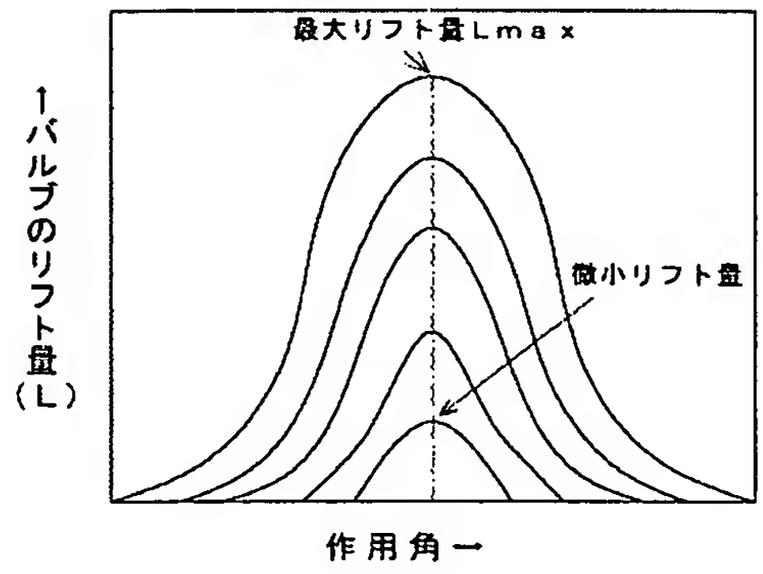
32
25
22
30
8
1
L°
5
6
21
23
11
11b
3

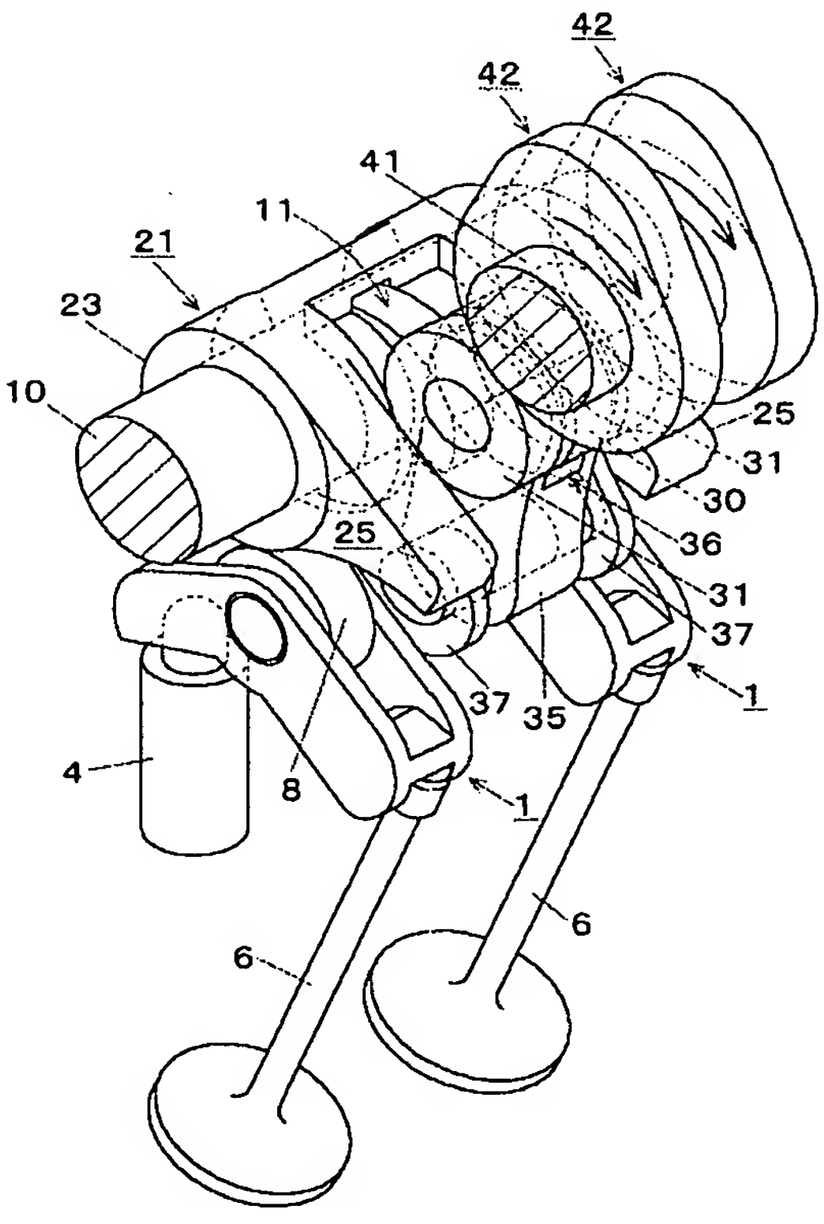
[Drawing 4]



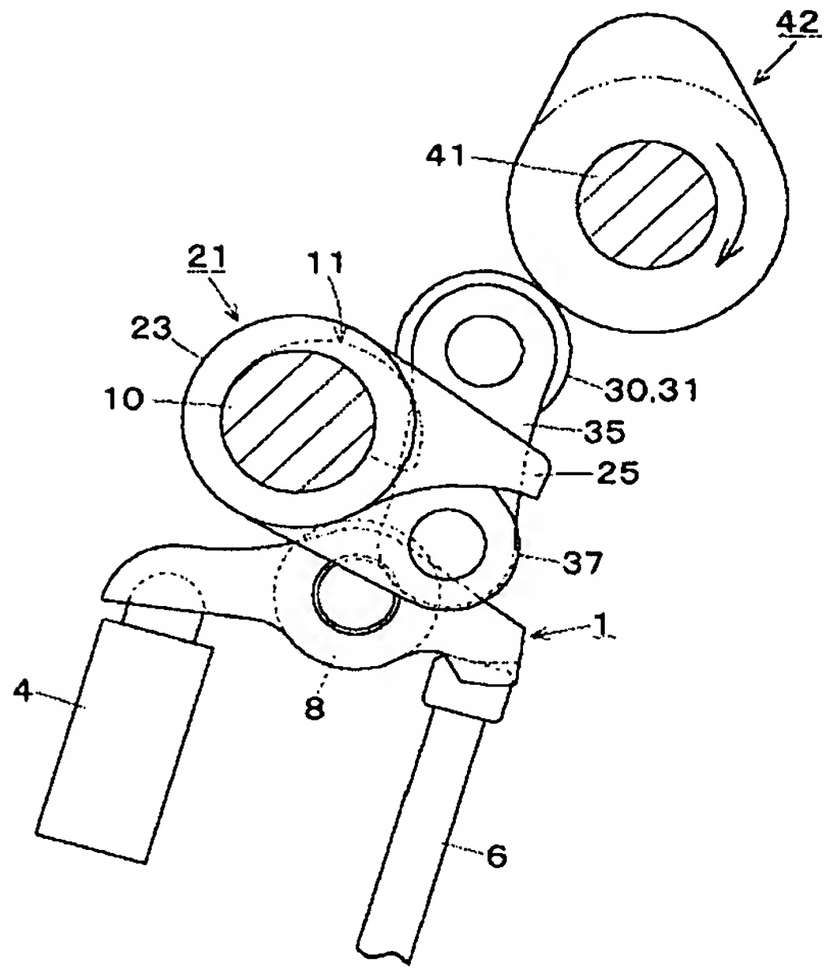
[Drawing 5]


最大リフト量Lmax
微小リフト量
バルブのリフト量（L）
作用角

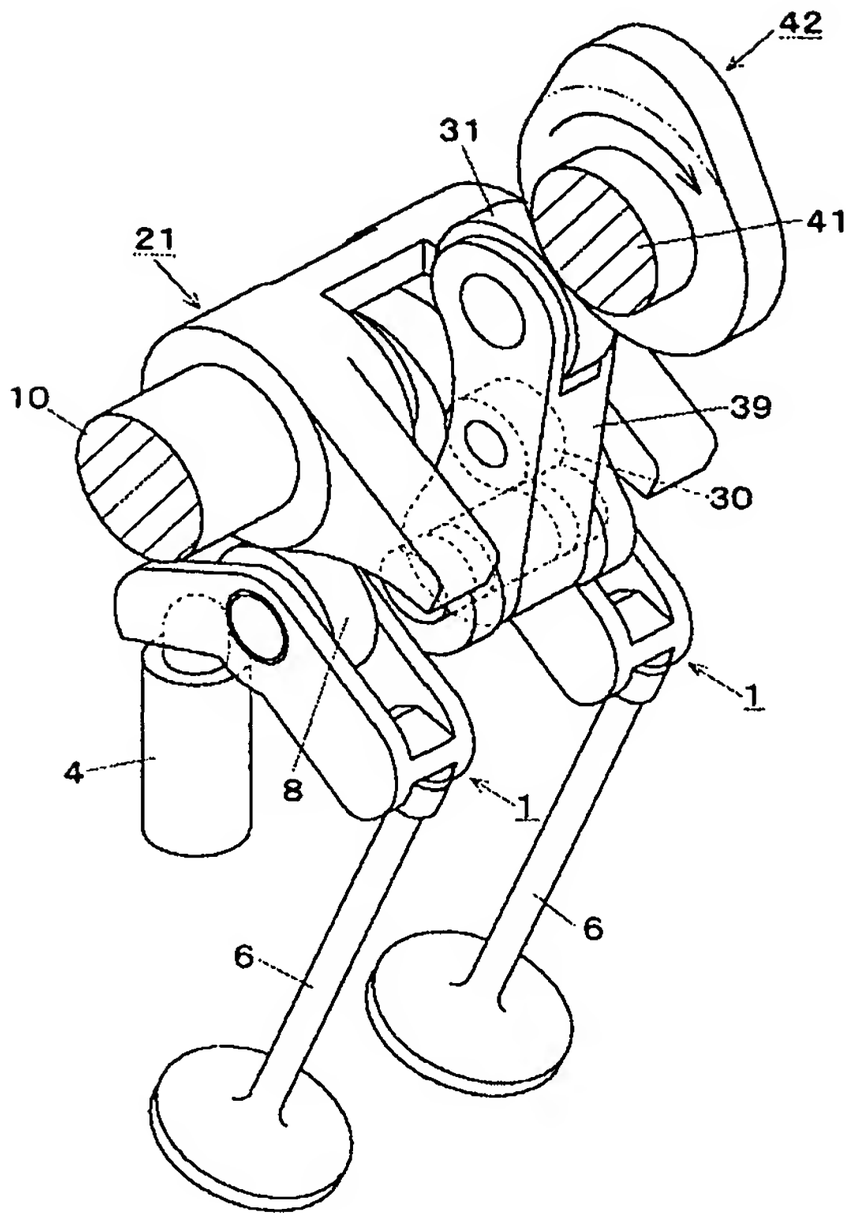
[Drawing 6]


42
42
41
11
21
23
10
25
31
30
36
31
37
1
37
35
4
8
1
6
6

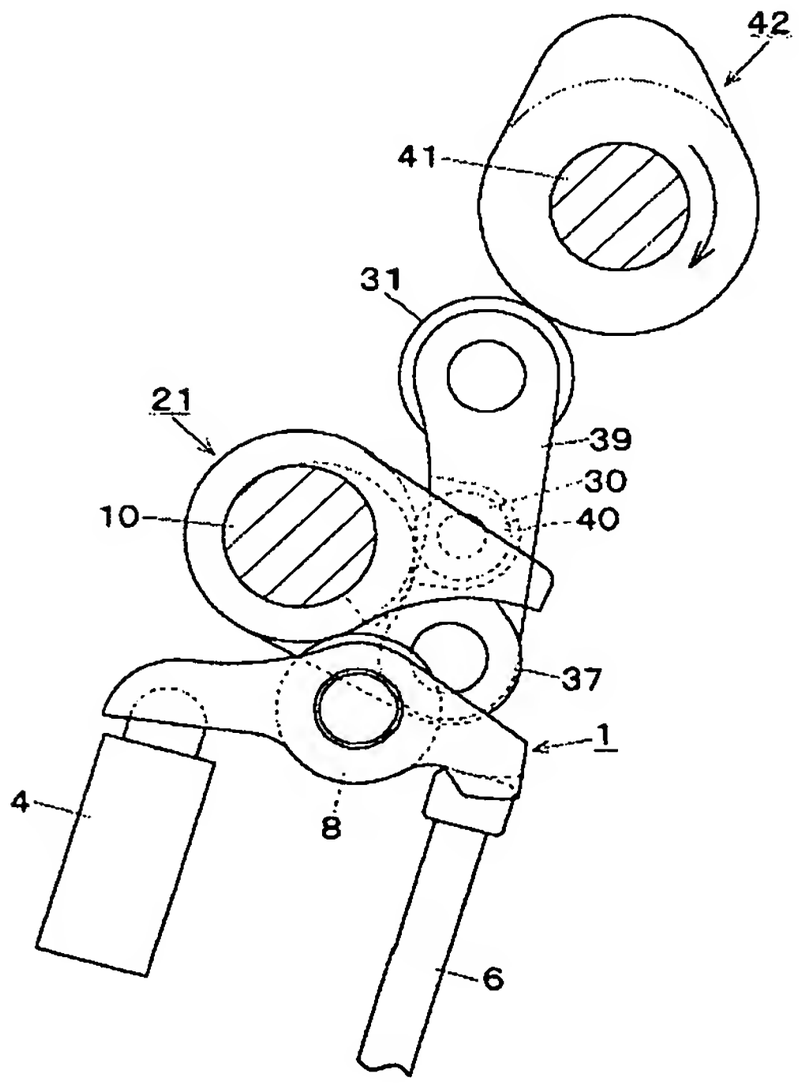
[Drawing 7]



[Drawing 8]



[Drawing 9]



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CORRECTION OR AMENDMENT

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F01L 13/00 301 Y
F01L 1/18 N

[Procedure amendment]
[Filing Date] May 27, Heisei 17 (2005. 5.27)
[Procedure amendment 1]
[Document to be Amended] Description
[Item(s) to be Amended] 0039
[Method of Amendment] Modification
[The content of amendment]
[0039]
Next, drawing 3 (a) -> (b) shows the operation by whenever [orientation angle / of the control cam 11 under the operation situation which needs the amount of minute lifts, and a minute working angle], and it. the time of the contact location to the third roller 31 of a rotating cam 42 being a location of base circle 42a under the operation situation which needs the amount of minute lifts, and a minute working angle, as shown in drawing 3 (a) -- the control cam 11 -- a nose -- orientation control is carried out so that near the small lobe of gradual increase section 11b may contact the second roller 30. Since the amount of projection becomes small from the time of the contact location of the control cam 11 where the second roller 30 has contacted being drawing 2 (a) at this time, a lever 32 is rotated whenever [corniculus] in the direction of a RRC rather than the time of drawing 2 (a) to the inclusion arm 21. Then, in order to carry out a variation rate in the direction in which the third roller 31 keeps away from a rotating cam 42 with a revolution whenever [corniculus / of a lever 32], the third roller 31 which is in contact with base circle 42a of a rotating cam 42 carries out the variation rate of the lever 32 upwards while carrying out the variation rate of the contact location with a rotating cam 42 to upper right direction rather than the time of drawing 2 (a) along with base circle 42a. In connection with the variation rate of this lever 32, an inclination and its location serve as a splash initiation angle of the inclusion arm 21 under the operation situation which needs the amount of minute lifts, and a minute working angle from the time of the inclusion arm 21 being drawing 2 (a) to mist or the upper part. Even if the splash initiation angle of the inclusion arm 21 at this time is called place to which it inclined a little below, since it is still high, the contact location of the press side 22 of the inclusion

arm 21 to the first roller 8 is the end face side (in detail body 23) of the arm section 25, and the lift of a bulb 6 is not generated yet.
[Procedure amendment 2]
[Document to be Amended] Description
[Item(s) to be Amended] 0043
[Method of Amendment] Modification
[The content of amendment]
[0043]
Next, drawing 4 (a) -> (b) shows the operation by whenever [orientation angle / of the control cam 11 under the operation situation which needs a lift pause], and it.
As shown in drawing 4 (a), when the contact location to the third roller 31 of a rotating cam 42 is a location of base circle 42a under the operation situation which needs a lift pause, orientation control of the control cam 11 is carried out so that base circle 11a (it can be said also as the peripheral face of the control shaft 10) may contact the second roller 30. Since the amount of projection becomes small from the time of the contact location of the control cam 11 where the second roller 30 has contacted being drawing 3 (a) at this time, a lever 32 is rotated whenever [corniculus] in the direction of a RRC rather than the time of drawing 3 (a) to the inclusion arm 21. Then, in order to carry out a variation rate in the direction in which the third roller 31 keeps away from a rotating cam 42 further with a revolution whenever [corniculus / of a lever 32], the third roller 31 which is in contact with base circle 42a of a rotating cam 42 carries out the variation rate of the lever 32 upwards while carrying out the variation rate of the contact location with a rotating cam 42 to upper right direction rather than the time of drawing 3 (a) along with base circle 42a. In connection with the variation rate of this lever 32, it inclines upwards further, the arm section 25 serves as an abbreviation horizontal from the time of the inclusion arm 21 being drawing 3 (a), and that location serves as a splash initiation angle of the inclusion arm 21 under the operation situation which needs a lift pause. Since the splash initiation angle of the inclusion arm 21 at this time is high, the contact location of the press side 22 of the inclusion arm 21 to the first roller 8 is the end face side (in detail body 23) of the arm section 25, and the lift of a bulb 6 is not generated.

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